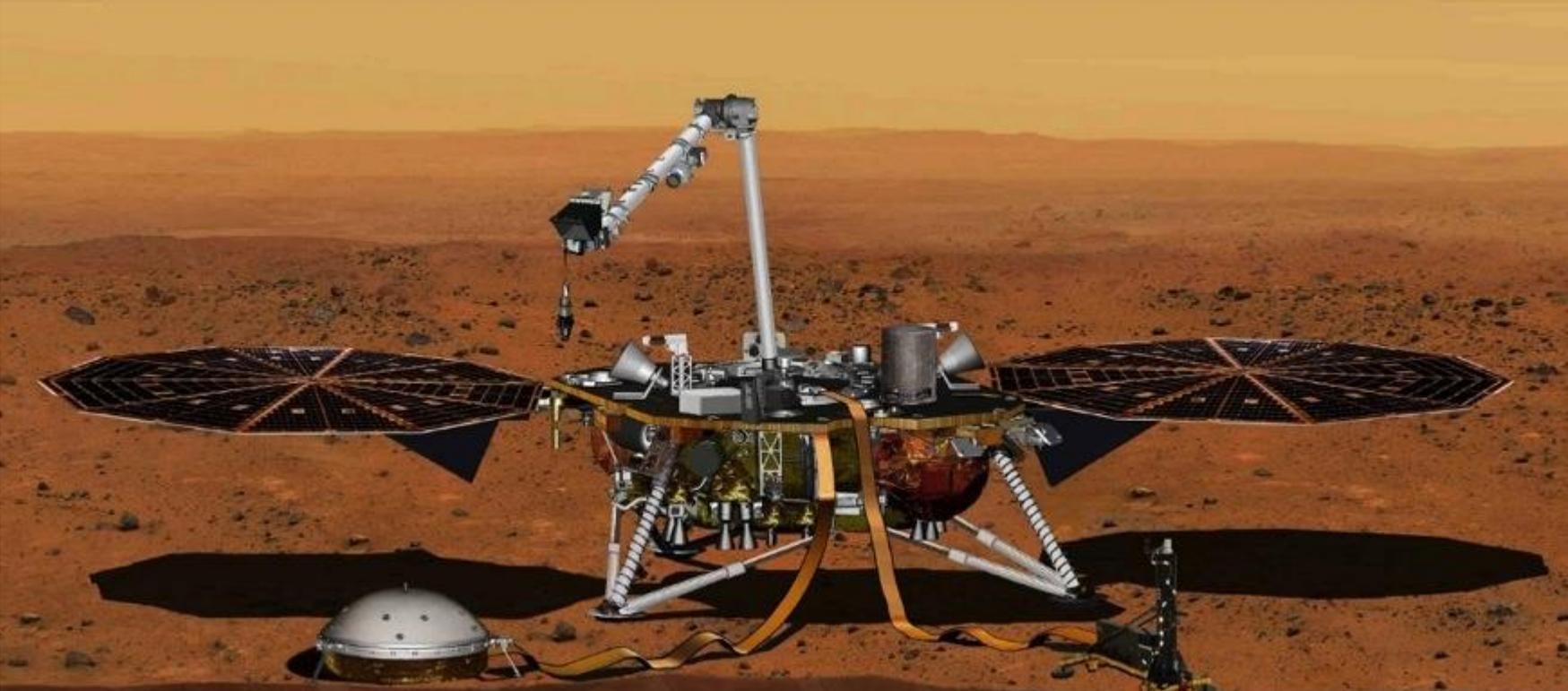


InSight Mission Status

Bruce Banerdt
Jet Propulsion Laboratory

2 March, 2016

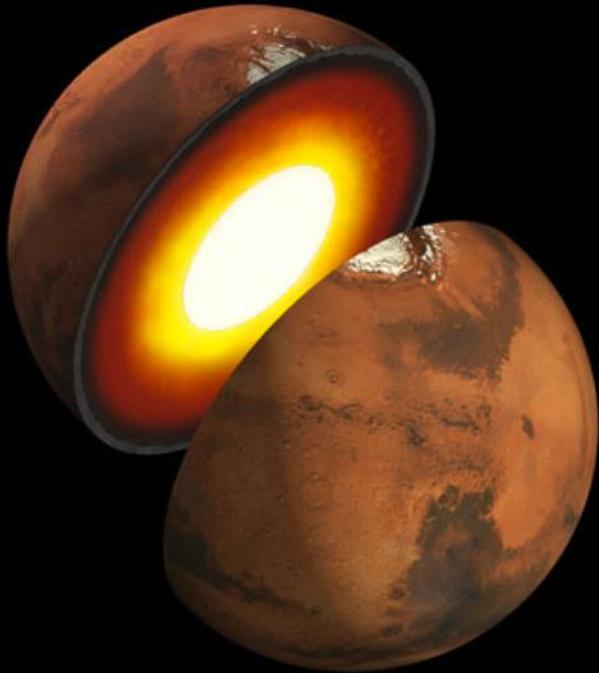


InSight Mission Status – “Plan B”

Bruce Banerdt
Jet Propulsion Laboratory

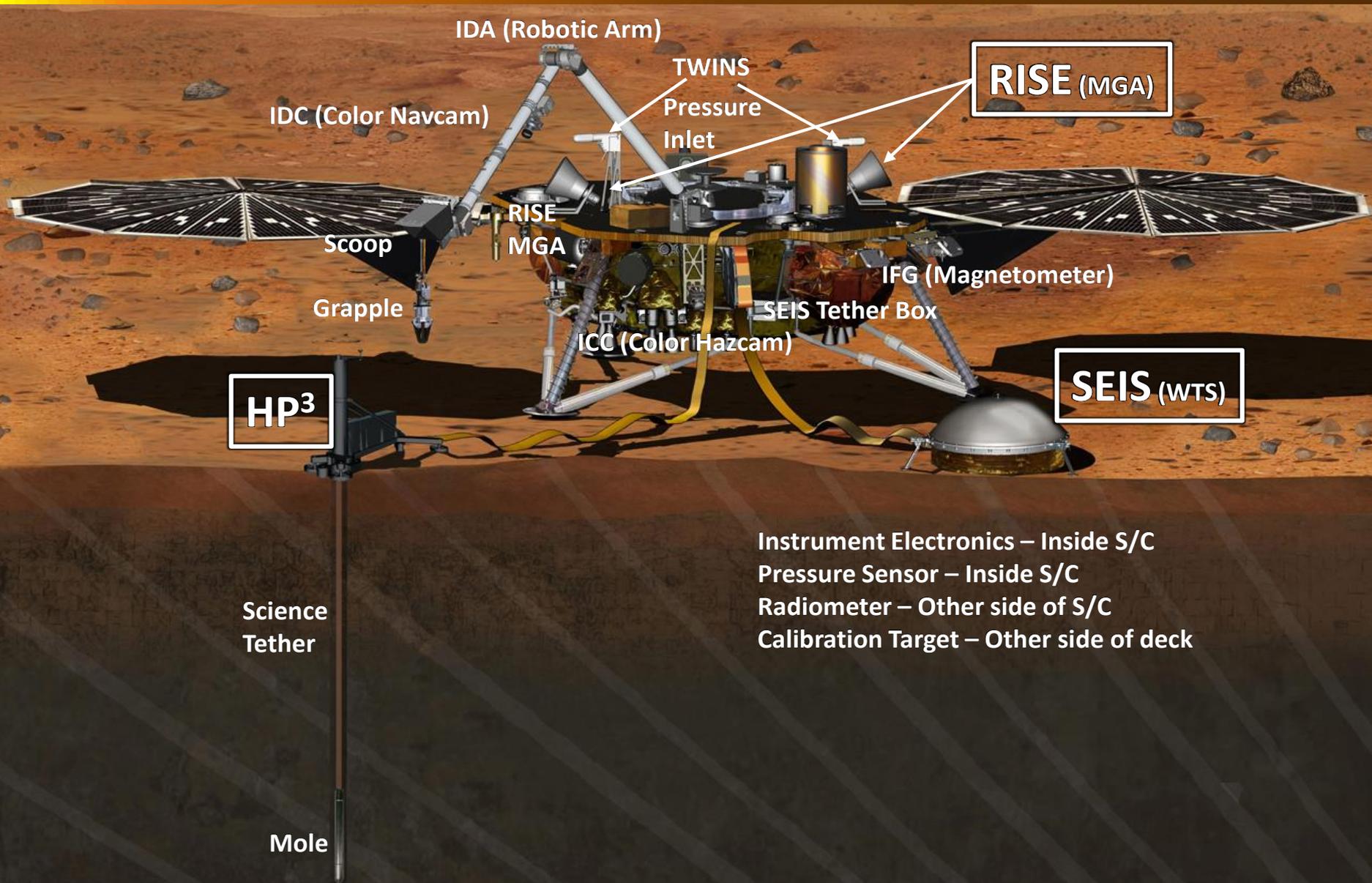
2 March, 2016

Understand the formation and evolution of terrestrial planets through investigation of the interior structure and processes of Mars.



Specific measurements:

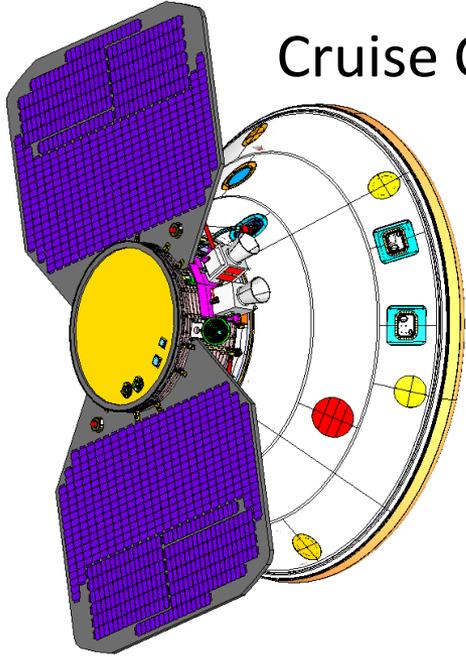
- **Crust thickness and layering**
- **Mantle composition and layering**
- **Core size, density and state**
- **Heat flow from the interior**
- **Frequency and location of marsquakes**
- **Frequency of meteorite impacts**



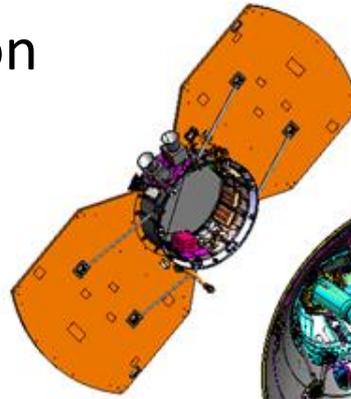


InSight Spacecraft

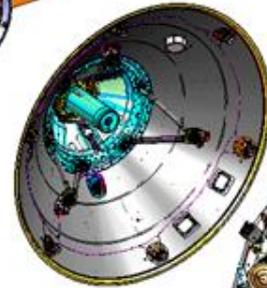
Cruise Configuration



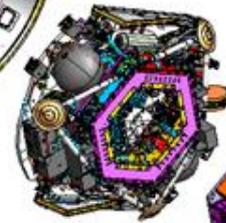
Cruise Stage



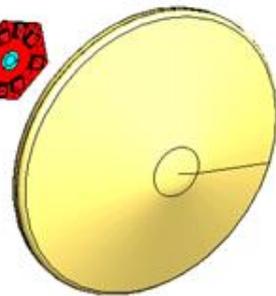
Backshell



Lander

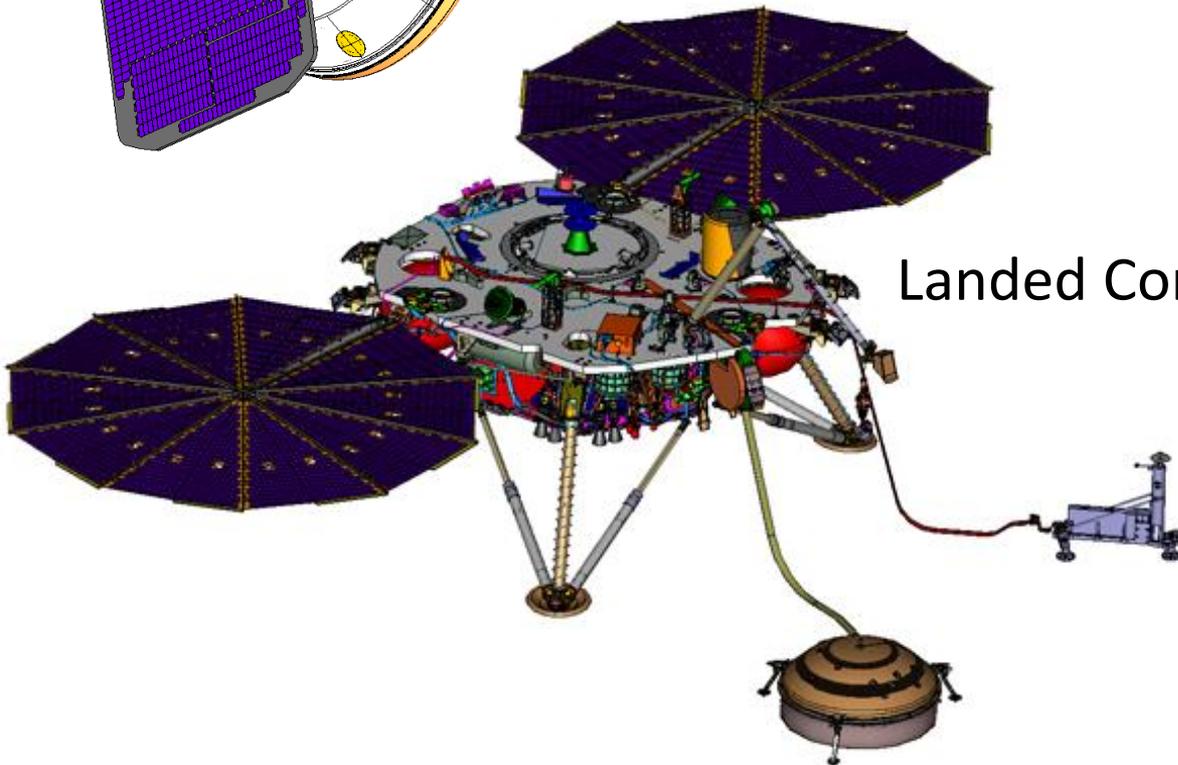


Component Deck/Cover



Heat Shield

Landed Configuration





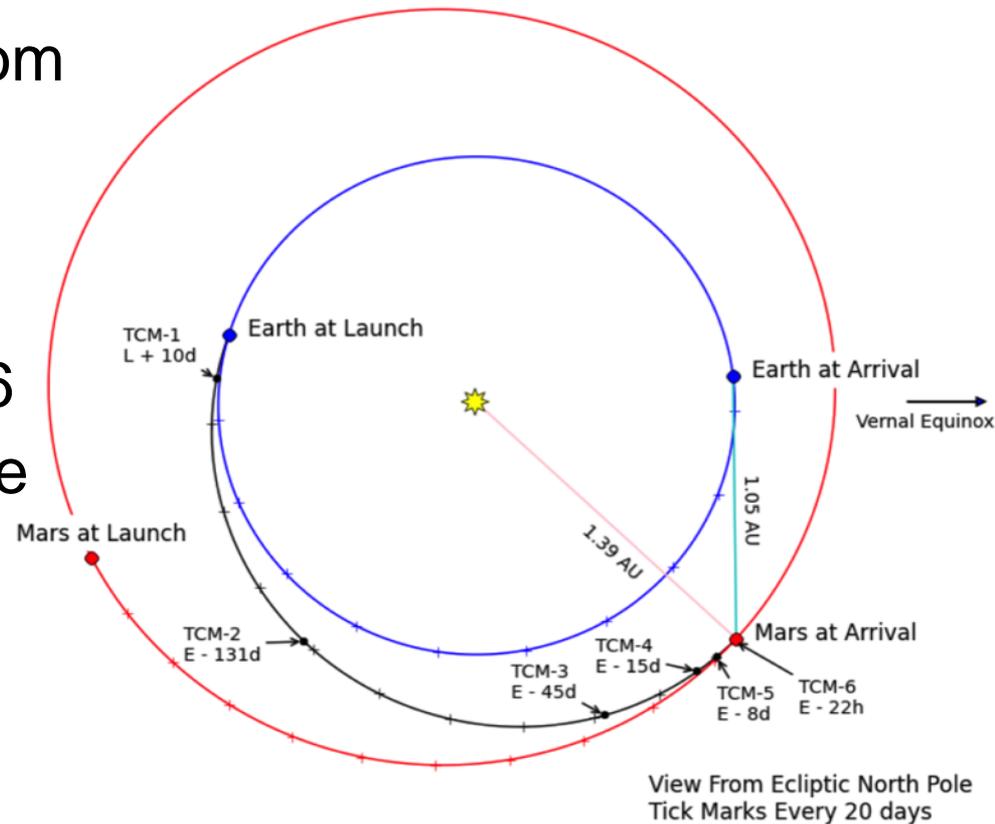
Spacecraft in Landed Configuration (LM, Denver)





- InSight uses a near-copy of the successful Phoenix lander
- Launch: March 4-30, 2016 from Vandenberg AFB, California
- Very fast, type-1 trajectory: 6.5-month cruise to Mars
- Landing: September 28, 2016
- Two-month deployment phase
- Two years (one Mars year) science operations on the surface; repetitive operations
- Nominal end-of-mission: September 26, 2018

Launch = 03/04/2016
Arrival = 09/28/2016





Landing Site – Western Elysium Planitia

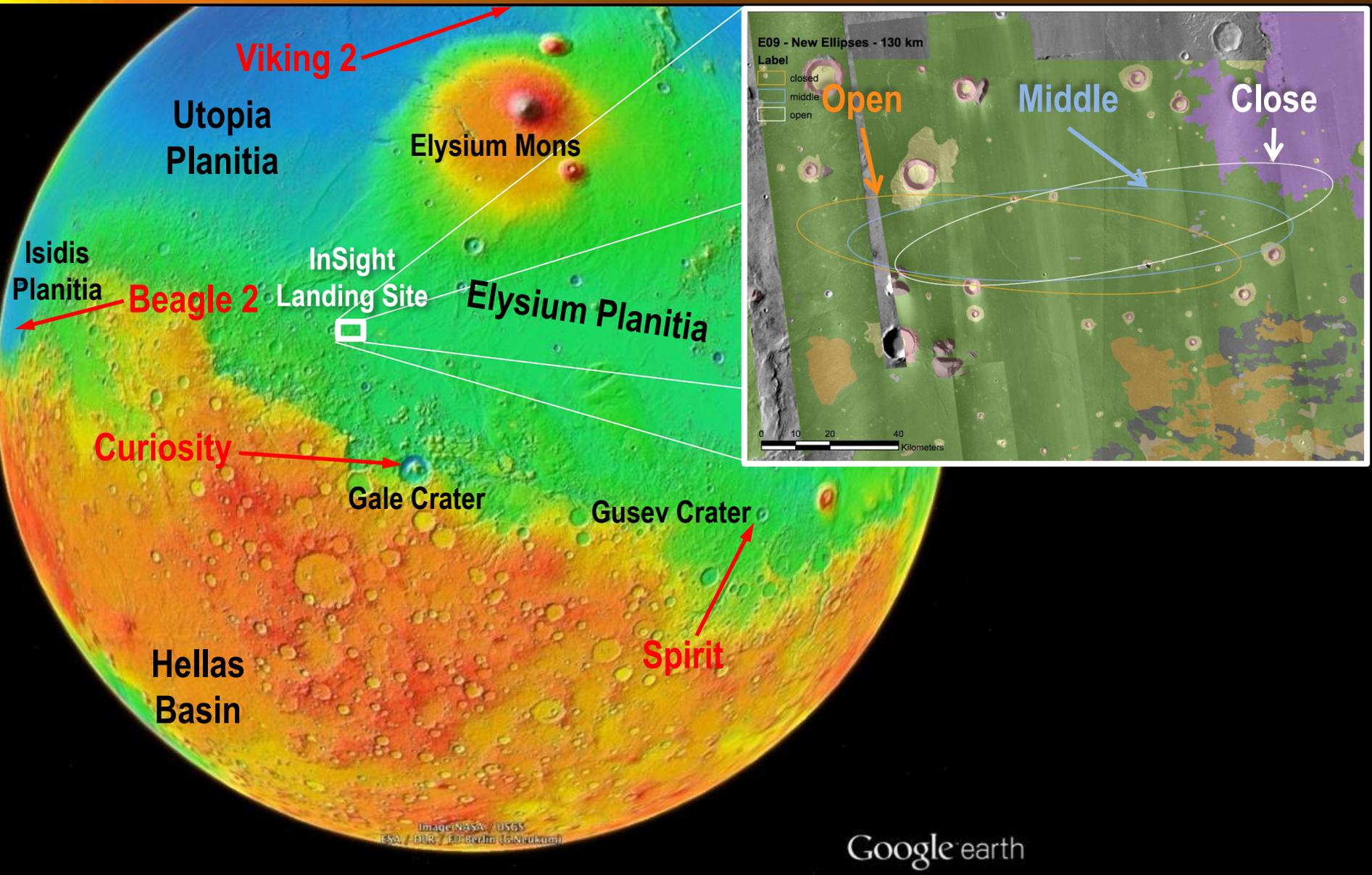


Image: NASA / USGS
ESA / DLR / FU Berlin (G. Neukum)

Google earth

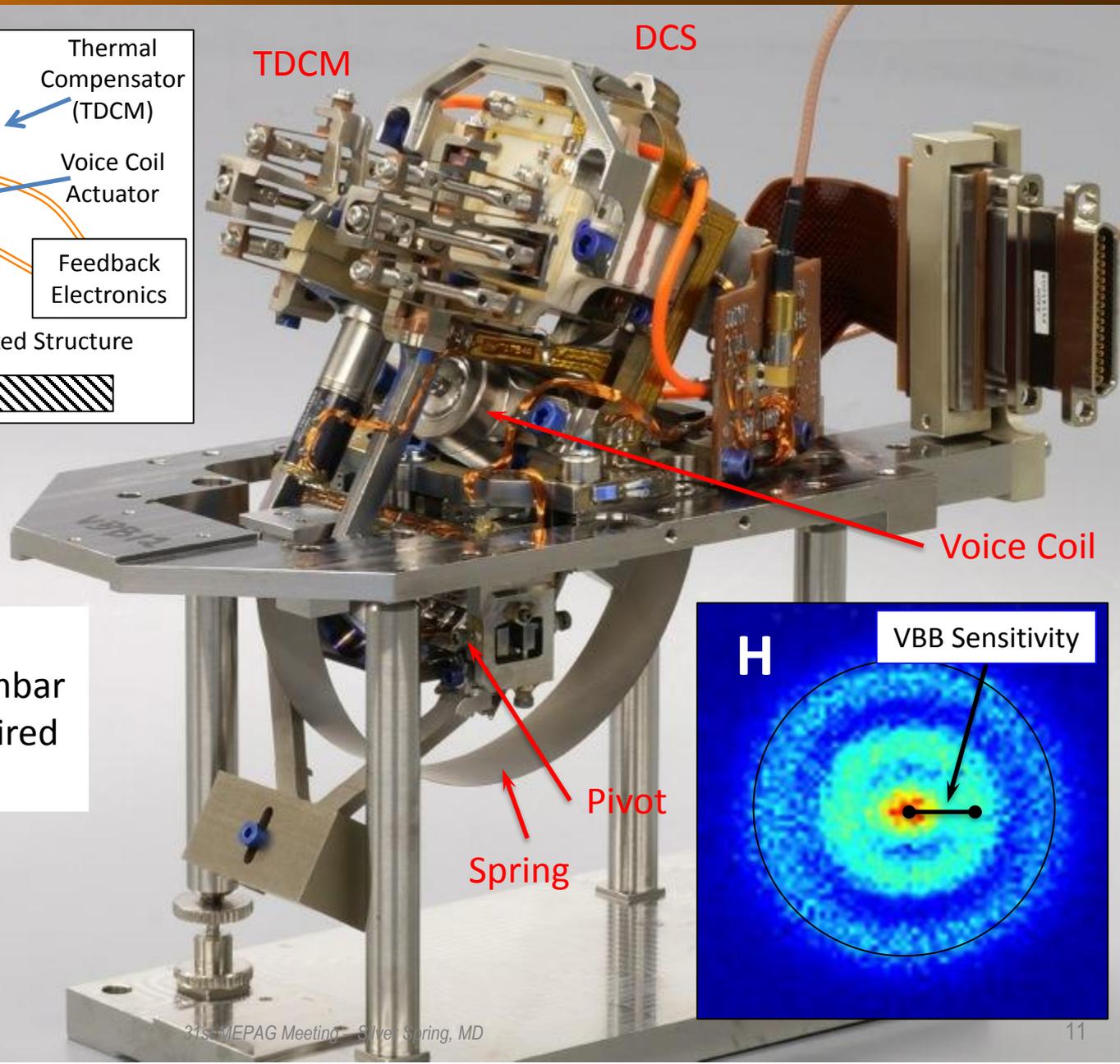
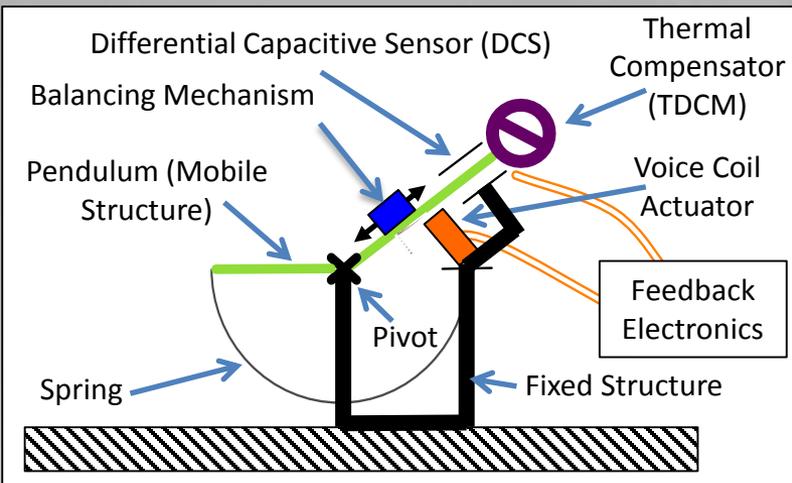
1°20'13.11" N 142°02'18.20" E elev -2482 m

Eye alt 4297.40 km

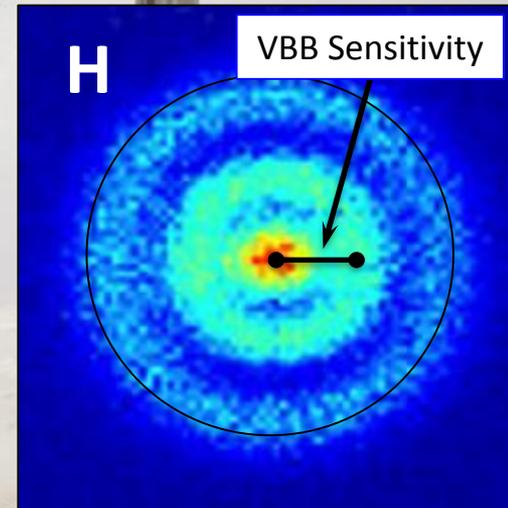
- June 25, 2015: Begin SEIS integration; complete performance and environmental testing
- Sept. 4, 2015: Deliver SEIS to Lockheed-Martin for integration onto lander
- Dec. 12, 2015: Ship lander to VAFB for final launch assembly
- Mar. 4, 2016: Launch
- Sept. 28, 2016: Land on Elysium Planitia ($L_s = 232$)
 - 42-sol deployment phase
 - 1 Mars year of science operations
- Sept. 26, 2018: End of nominal mission

- June 25, 2015: Begin SEIS integration; complete performance and environmental testing
- ~~Sept. 4, 2015: Deliver SEIS to Lockheed-Martin for integration onto lander~~ – Vacuum failure detected on Aug. 25
- Dec. 12, 2015: Ship lander to VAFB for final launch assembly
- Mar. 4, 2016: Launch
- Sept. 28, 2016: Land on Elysium Planitia ($L_s = 232$)
 - 42-sol deployment phase
 - 1 Mars year of science operations
- Sept. 26, 2018: End of nominal mission

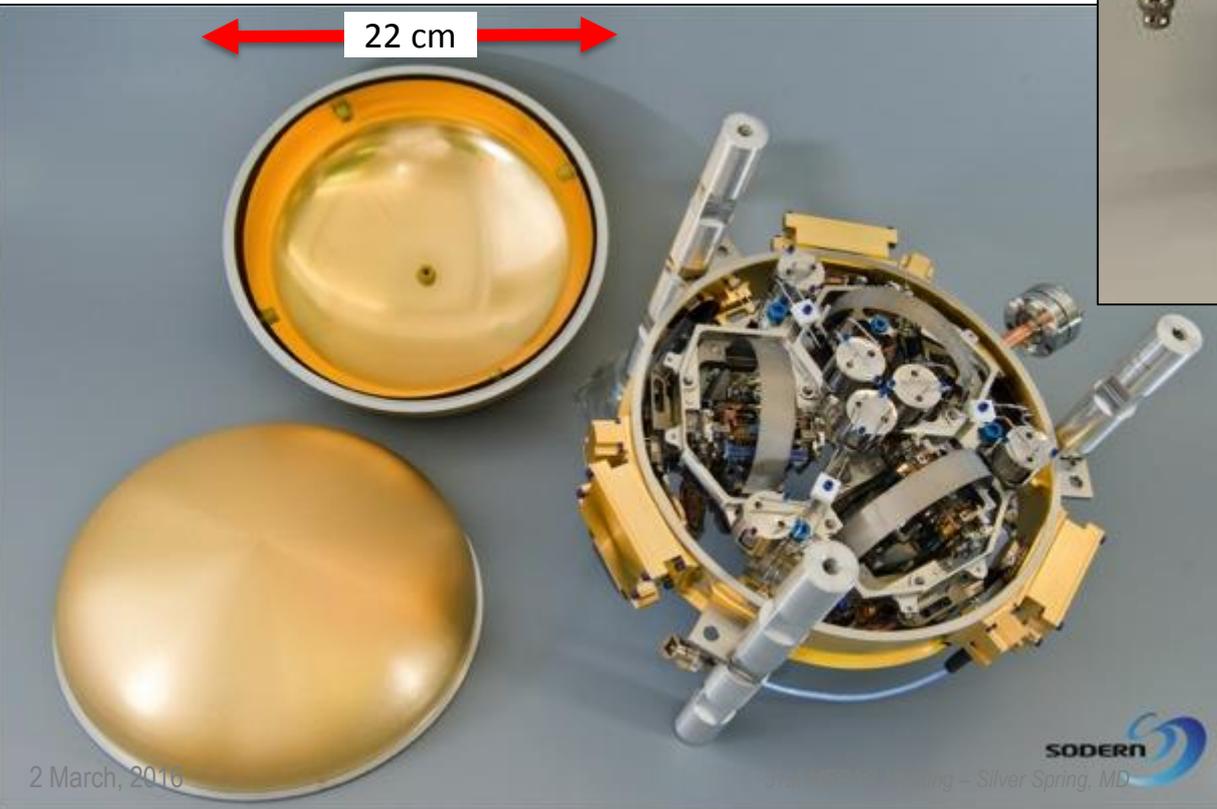
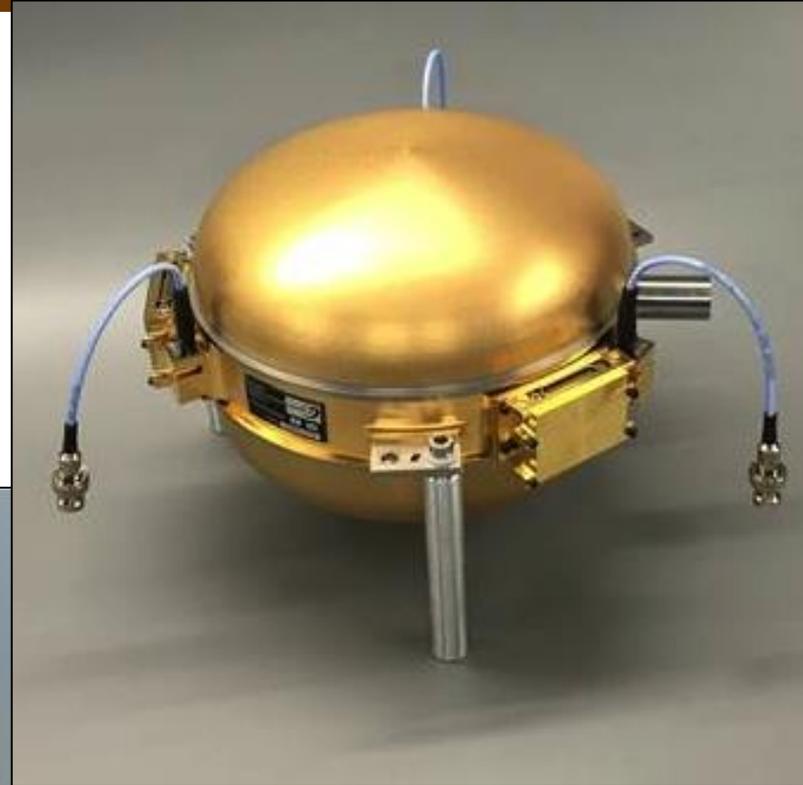
VBB (Very Broad Band) Sensor



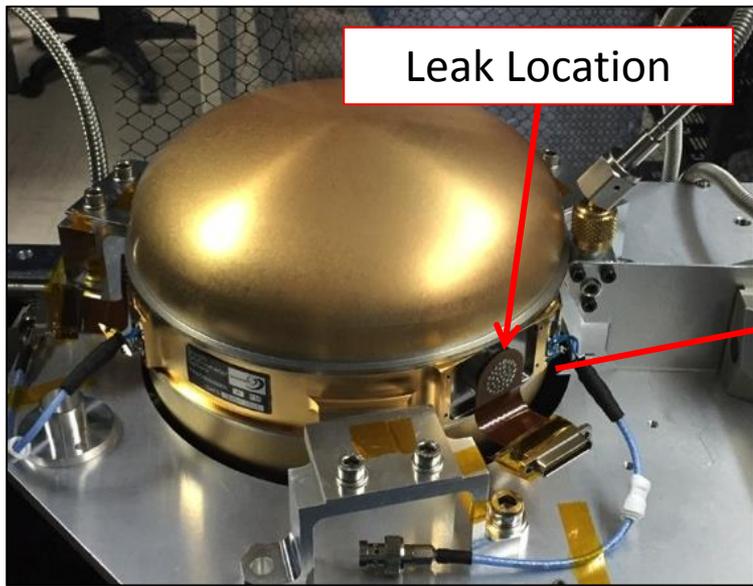
Must be operated at a pressure less than 10^{-2} mbar in order to achieve required sensitivity



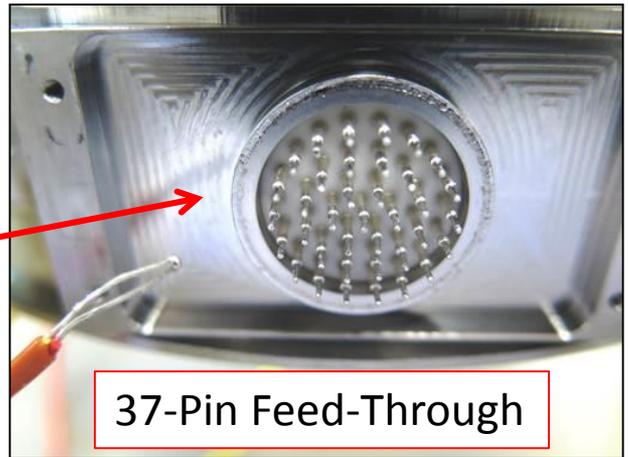
SEIS Sphere/EC (Evacuated Container)



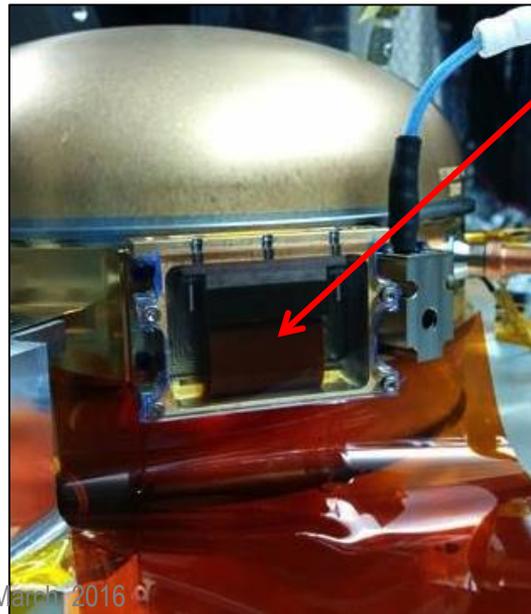
- **First Leak in Evacuated Container**
 - 8/25: Leak first detected during SEIS performance testing after system TVAC
 - 9/14: Leak localized to 37-pin electrical feed-through for VBB10
 - 9/22: Leak further localized to one pin (pin 7) of feed-through
 - 10/2: Sealing compound applied to pin 7, successfully stopped the leak
- **Second Leak**
 - 10/7: Found second leak (factor of ~10 smaller) on pin 11 of same feed-through
 - 10/9: Sealing compound applied to pin 11, only temporarily stopped the leak (failed four days later during subsequent cold temperature cycle)
 - 11/10: Encapsulated entire feed-through, successfully stopped the leak
- **Third Leak**
 - 11/14: Detected third leak during cold cycle of sphere, later localized to queusot (evacuation tube) pinch-off
 - 12/10: New queusot welded to sphere
- **Fourth Leak**
 - 12/20 – Fourth leak detected during cold cycle of sphere; later localized to encapsulated VBB10 feed-through



Leak Location

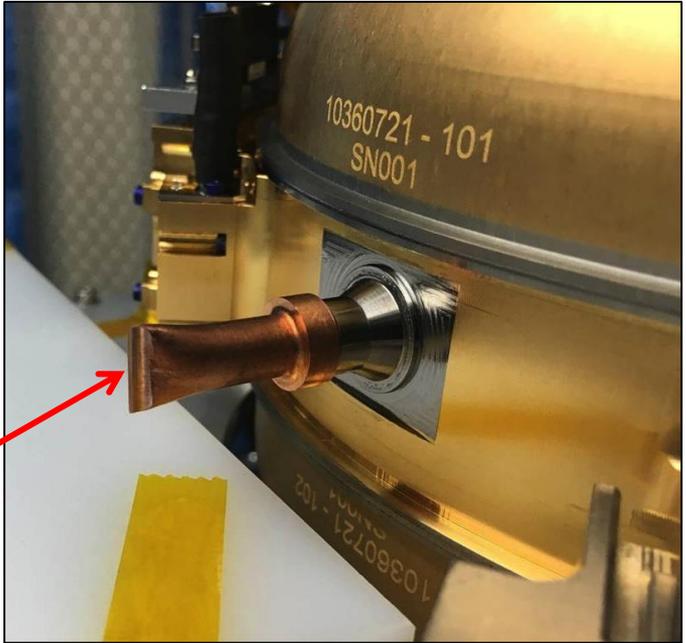


37-Pin Feed-Through



Feed-Through Encapsulation

Location of 3rd Leak



- Since the beginning of January, we have undertaken a complete replan of the InSight mission
 - Started on new mission design: Launch, cruise, EDL for 2018 Mars launch opportunity
 - Intensely studied failure of SEIS Evacuated Container, began process of modifying the design
 - Put together preliminary schedule and budget for move to 2018
 - Subjected both SEIS and overall mission to critical external reviews – goal is to reduce mission risk wherever practical
- New plan was presented to NASA on March 1
 - With this information in hand, SMD is considering options for continuing (or canceling) the mission

- Oct. 2016: Complete design modification, fabrication and test of SEIS Evacuated Container
- May 2017: Complete SEIS environmental/performance testing
- June 2017: Begin spacecraft integration and test
- Feb. 26, 2018: Ship lander to launch site for final assembly
- **May 5, 2018**: Launch from Vandenberg Air Force Base, CA
- **Nov. 26, 2018**: Land on Elysium Planitia ($L_s = 296$)
 - 42-sol deployment phase
 - 1 Mars year of science operations
- Nov. 24, 2020: End of nominal mission